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Like many other synthetic, ancient types, the fossil representatives were of colossal size compared with the living survivors.

While some of the fossil forms were of moderate size, though very large compared with Nebalia, some must have been of gigantic proportions. For example, in *Dithyrocaris neptuni* Hall, of which Fig. 9 represents the telson and cercopoda of natural size, the entire animal must have been some two feet in length. The *Echinocaris punctatus* must have been nearly a foot in length, while the Echinocarides (Figs. 10 and 11), described recently by Mr. R. P. Whitfield, were considerably smaller.

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AMERICAN WORK ON RECENT MOLLUSCA IN 1881.

BY WILLIAM H. DALL.

(Continued from November number.)

Psychology.—Owing to the secluded life of most mollusks they are not easily subjected to long-continued observation, and perhaps for this reason notes on their affections or mental processes are nearly unknown. But that careful observation would reveal in many mollusks a much higher degree of intelligence than they are usually credited with, there can be little doubt. A small contribution to this subject is contained in the paper on "Intelligence in a Snail," by the writer (AM. NAT. Dec. 1881, pp. 976–7). The observations there noted indicate that some species of the genus Helix are capable of recognizing a call or sound, and of distinguishing it from other calls or sounds. Since this was printed the writer has had information of two other cases of the same kind, though the facts are less clearly indicated than in the one first mentioned. Dr. Lockwood's observations on Mytilus indicate a certain degree of intelligence, and it cannot be doubted that observations on cephalopods would show that these highly organized mollusks are capable of more or less complex mental operations.

Geographical Distribution and Catalogues.—In the Annals N. Y. Acad. Sci. (II, pp. 117-126) in an article "On the relations of the fauna and flora of Santa Cruz, W. I.," Bland shows, from a discussion of the land shells, that it is probable that St. Thomas and other islands of the Virgin group were formerly connected with Santa Cruz, but that in spite of a submarine ridge (with, however, 700 fathoms of water over its greatest depression) extending to Saba, there is no evidence of a dry-land connection of the latter with the rest. He also places some facts on record in regard to an asserted desiccation of the island of Santa Cruz, and concludes that there is no sufficient proof of it nor of an alleged conflagration caused by the French colonists in 1650.

To the "History of Fremont county, Iowa," Professor Call has contributed a chapter on the geology and natural history, which has been separately issued, with new pagination, with the date of Nov., 1880. The Mollusca are treated of on pp. 34–36, where is given a list of thirty fresh-water and ten land shells, none of them peculiar to the locality, more than half of which are bivalves, mostly Naiades.

In the Annals N. Y. Acad. Sci., II, 1881, pp. 129–139, Dr. Stearns discusses the introduction of *Helix aspersa* L., in California, together with the synonymy, relations and habitat of several South Californian species.

"On the geographical distribution of certain fresh-water mollusks of North America, and the probable causes of their variation" (Part I, Jan., 1881, pp. 8; Part II, July, 1881, pp. 11; Journ. Cincinnati Soc. Nat. Hist, IV, 1881). The two papers above cited contain an interesting resumé, from Professor Wetherby's point of view, of a number of singularities in geographical distribution of American fresh-water shells. We are of the opinion that when the facts are fully determined in regard to the fossil as well as the recent forms, which unfortunately is not yet the case, results of value will be obtained. The author wisely does not, as yet, endeavor to formulate any results, but calls attention to the facts with a promise of further studies in the future.

Stearns (AM. NAT., May 1881, pp. 362–6) discusses the distribution and synonymy of "*Mya arenaria* in San Francisco bay," arriving at the doubtless correct conclusion that it has been introduced probably not earlier than 1872 or 1873, on oyster "seed," planted by importers from the eastern coast, to grow and fatten in the bay. It has now almost entirely superseded other "clams" in the San Francisco markets, and has spread or been introduced also at Santa Cruz.

Dr. Lockwood notes (AM. NAT., Nov., 1881, p. 908) the finding of the third fresh specimen (since 1876) of *Argonauta argo* L., on the New Jersey coast. Two occurred at Long Branch, the other fifteen miles south of it. One was living when found. The argonaut may therefore be said with truth to belong to the fauna of the east coast of the United States.

"Observations on the species of the genus Partula Fér., with a bibliographic catalogue," by W. D. Hartman, M.D. (Bull. Mus. Comp. Zoöl., IX, No. 5, 8vo, pp. 171–196, with two diagram plates, Nov., 1881).

This paper contains no descriptions of new species, but is a succinct review of the genus in general, with a list of the species with references to descriptions and figures; a list of terrestrial species as distinguished from those which live in trees; another list of spurious species in which the reference to *P. auriculata* Pfr., as a Tornatella would seem to be a typographical error. There is also an account of an examination of two bushels of duplicates from the Pease collection now in the possession of the Mus. Comp. Zoölogy, and two plates of diagrammatic maps prepared by Andrew Garrett, showing the distribution of the forms of Partula on five of the Polynesian islands. It would seem as if a very important contribution to the study of the origin of species might be made by a keen-eyed and competent observer who should be willing to devote himself for a year or two to the study of these extremely local races, their environment and hybridization, on one of these islands. It is perhaps unnecessary to say that the information in this paper is fuller and more accurate than is to be elsewhere found on the same topic, and that it will be a welcome contribution should Dr. Hartman complete, as it has been rumored was his intention, a similar annotated synonymical catalogue of the Achatinellidæ.

Dr. W. D. Hartman has had printed "A Catalogue of the genus Partula" (F. S. Hickman, West Chester, Pa., 1881, 8vo, pp. 14, cuts), enumerating the species with their synonyms, and dividing them into two sections, of which one contains ten and the other five subordinate groups, and these again are subdivided by characters of less importance. To the divisions of the sections new names have been applied, and they are termed subgenera, though the characters by which they are separated are superficial rather than structural. These subgenera are as follows: Partula (*P. faba* p. 6); Nenia (*P. N. auriculàta*, Brod. p. 7); Astræa (*P. A. dentifera*, Pfr. p. 7; preöccupied in cœlenterates, 1789); Clytia (*P. C. umbilicata*, Pse. p. 8; preoccupied in cœlenterates, 1812); Ilia (*P. I. lutea*, Lesson, p. 8; preoccupied in crustacea, 1817); Œnone (*P. Œ. hebe*, Pfr. p. 9; preoccupied in vermes, 1817); Helena (*P. H. Otaheitana*, Brug. p. 9); Pasithea (*P. P. spadicea*, Reeve, p. 10;

preoccupied in cœlenterates, 1812, and otherwise); Ægga (*P. Æ. decussatula* Pfr. p. 11; preoccupied in crustacea, 1815); Echo (*P. E. arguta*, Pease, p. 11; preoccupied in insects, 1853); in the second section Latia (*P. L. ganymedes*, Pfr. p. 12; preoccupied in mollusca, 1849); Evadne (*P. E. bulimoides*, Lesson, p. 12; preoccupied in crustacea, 1846); Harmonia (*P. H. gibba*, Fér. p. 13; preoccupied in insects, 1846); Matuta[1] (*P. M. rosea*, Brod. p. 14; preoccupied in crustacea by Fabricius); Sterope (*P. S. carteriensis*, Quoy and Gaim. p. 14; preoccupied in insects, 1850. The types are illustrated by rather coarse wood-cuts in the text.

This catalogue represents, better than any previous arrangement, the relations of the different species to each other, and is the result of some years conscientious study, aided by the best existing collection of the shells themselves. It is, therefore, unfortunate that, at the last moment, as it were, it should have been somewhat hastily printed. We are authorized, on the part of the author (who as much as any one else regrets the circumstance), to state that he desires to withdraw, as far as lies in his power, the names applied to the sections of Partula, which he is now of the opinion are perhaps hardly important enough, from a systematic point of view, to deserve naming; and that he has in preparation a new catalogue which will embody some revisions, some new species lately described and but recently received by Dr. Hartman, and in which he will adopt the classification indicated by Dr. Pfeiffer in his posthumous work, "Nomenclator Heliciorum Viventium," etc.

A list of the Mollusca (two cephalopods, twenty-five gasteropods, twenty-three lamellibranchs) forms part of a paper by Mr. R. Rathbun, on "The littoral marine fauna of Provincetown, Cape Cod, Mass.," in the Proc. U. S. Nat. Mus., III, pp. 116–133, June, 1880. A reference to this paper was accidentally omitted from this record for 1880.

In AM. NAT., May, 1881, pp. 390–91, Professor R. E. Call describes a new Texan Unio, *U. bollii* Call, from the Colorado river, Texas, collected by the late Professor Jacob Boll. It is perhaps most nearly allied to *U. quadrans* Lea. We may here call attention, though not strictly within our limits, to his list in the July number (p. 585) of the recent land and fresh-water shells found fossil in the Iowa loess, and which in his opinion determine it to be a lacustrine formation.

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[1] Printed Matata, but the derivation given shows this to be a typographical error.

"Notes on *Succinea campestris* and *S. aurea*" (AM. NAT., May, 1881, pp. 391–2). Professor R. E. Call extends the limits of the first species as far as New Orleans in the west, and Charleston, S. C., on the north, and of the second to Central and Southeastern New York. He also adds Southwest Iowa (Nishnabotna river) as a new and so far the most western locality for *Unio pressus* Lea.

Our Home and Science Gossip, a monthly periodical published at Rockford, Illinois, has a "department" devoted to *Conchology* which deserves encouragement and a better proof-reader. In the number for June 15th, 1881, A. A. Hinkley mentions a pond near the Pecatonica river, near Rockford, and Mercer county, Illinois, as localities for the rare *Limnæa zebra* Tryon.

W. W. Calkins announces a "complete monograph" of the molluscan fauna of Illinois, to be published within the year, and asks for coöperation from local naturalists. The object of Mr. Calkins is a worthy one, and which should be promoted at home and imitated in other States of the Union, especially if Mr. Calkins gives as good figures of the species as those which have illustrated some of his papers noticed in this record for previous years.

J. B. Upson contributes notes on *Limnæa desidiosa* Say, and *Physa gyrina* (found by "millions," in a rain-flooded stone quarry which was thirty-five rods from any stream of water), *Unio alatus* Say, and *Vertigo simplex* Gould. Large numbers of the Unio from Rock river, were examined. Two-thirds proved to be males. Young ones were extremely rare. The nacre of the females, without exception, was much lighter than that of the males, being sometimes nearly white, while the males were of various shades of purple. In the male shells the intensity of color varied with the "thickness of the mantle," the shells of darkest hue being secreted by "the very thickest mantle." They sometimes produce pearls. The Vertigo was described by Gould in 1840, and has been found in Canada and New England. In the winter of 1880–81, Mr. Upson found it near Cedar Keys, Florida, associated with *Pupa rupicola* Say, on decayed wood. No intermediate stations are known, and further confirmation of this very interesting discovery would be gratifying.

Mr. Upson also contributes hints to collectors, and offers prizes for the best collections made by children of the public schools.

It will be seen that this little miscellany is by no means without interest, but worse typographical blunders than those which occur in it are rarely to be found; and the editor has included an account of "coon oysters" on the coast of Florida, clipped from some exchange, under the head of *Icthyology!*

Descriptive and Systematic Papers.—As usual, the recorder finds it difficult to assign many papers to any of the definite heads used in this record, since they combine descriptive and other matters under one title, and the recorder's time and facilities do not permit him to attempt any exhaustive analysis like that of Professor von Martens in the *Zoölogical Record.* Still the rough arrangement here adopted is not without a certain use, and for that reason has been retained.

"On the genera of Chitons," by W. H. Dall (Proc. U. S. Nat. Mus., 1881, pp. 279–291, Dec.). In this article the writer has given brief but sufficient diagnosis of all the divisions of the Chitonidæ recognized by the late Dr. Carpenter and himself, both recent and fossil. All the groups are restricted, some here first characterized, but most of them have heretofore been made public. In the present arrangement all are brought together in their systematic relations, and their chief characteristics tabulated. The writer observes, "with the above data and those comprised in my report on the Limpets and Chitons of Alaska, students should be pretty well able to refer any Chiton of whose characters they have made themselves masters, to its proper place in the general classification." The following names are proposed for Palæozoic Chitons on the authority of Dr. Carpenter's MSS., and should be credited to him. Chonechiton, Pterochiton, Loricites and Probolæum. Cymatochiton Dall, is proposed for Cymatodus Carpenter, preoccupied in vertebrates.

Among recent genera and subgenera hitherto only in MS. or imperfectly characterized, diagnoses are given of Deshayesiella Cpr., Callochiton Gray, Stereochiton Cpr., Leptoplax Cpr., Spongiochiton Cpr., Callistoplax Cpr., Angasia Cpr., Ceratozona Dall (for Ceratophorus Cpr., non Diesing, 1850), Pallochiton Dall (Hemphillia Cpr., non Binney), Fannettia Dall (Fannia Gray, non Robineau-Desvoidy, 1830), Sclerochiton Cpr., Lucilina Dall (Lucia Gld., non Swainson, 1833), Francisia Cpr., Dinoplax Cpr., Middendorfia Cpr. (Dawsonia Cpr., 1873, preoc.), Beanella Dall (Beania Cpr. non Johnstone), Arthuria Cpr., Aulacochiton (Shuttleworth restr.) Cpr., Fremblya H. Adams (= Streptochiton Cpr., MS.), Euplaciphora (Shuttleworth restr.) Cpr., Guildingia Cpr., Macandrellus Cpr., Stectoplax Cpr., Choneplax Cpr., Chitoniscus Cpr. (non Herrmanssen). It is believed that the publication of these tables will be beneficial in several ways, as in giving a general view of Dr. Carpenter's classification, and especially in calling attention to the characters which it is desirable should be distinctly noted by those who may describe new species of Chitonidæ, for the want of which it is impracticable in the majority of cases, to properly classify by determining the genus or even to subsequently recognize the species. The publication of the entire monograph only awaits the preparation of the illustrations (already drawn) which have been delayed by circumstances entirely beyond the writer's control.

"The Cephalopods of the northeastern coast of America." Part II. "The smaller Cephalopods (etc.)," by A. E. Verrill (Trans. Conn. Acad. Sci., V., pp. 259–446, pl. XXVI–LVI, June, 1880, Dec., 1881). Part I of this important work was noticed in this record for 1880. The second part is now completed, forming full material for a manual of the subject, which it is understood will be issued in the form of a "Report on the Cephalopods," in connection with the "U. S. Fish Commission Report for 1879," which appears early in 1882.[1] The first two sheets, which appeared in 1880, contain references to additional specimens of *Architeuthis harveyi*, and a full description of *Ommastrephes illecebrosus* (Lesueur) Verrill. The new names applied in the subsequent portion of the paper are Cheloteuthis for *C. rapax* n. s. (by typographical error Chiloteuthis) from a somewhat imperfect specimen which is subsequently referred to as a synonym of *Lestoteuthis fabricii* (Stp.) Verrill (*Sepia loligo* Fabr. Fauna Grönl.); Desmoteuthidæ V. fam. nov. containing Desmoteuthis n. g. erected upon *Leachia hyperborea* Stp.; two new varieties (borealis and pallida) of *Loligo pealei* Lesueur; Stoloteuthis n. g. for *Sepiola leucoptera* V.; *Rossia megaptera* V. n. s. from near Newfoundland; and Alloposidæ V. fam. nov. for Alloposus V. (1880). An appendix follows, with descriptions of additional material and a criticism of several papers by Streenstrup and Owen, published nearly simultaneously with the earlier parts of Verrill's work, thereby causing some entanglements in nomenclature, for an account of which the reader is referred to the paper itself. Several new names appear in this appendix, e. g. *Brachioteuthis* (*beanii* V.) g. et sp. n. from fish stomachs off Martha's Vineyard; *Chiroteuthis lacertosa* V. n. s. for a form from the eastern coast of North America of which a fragment was referred to *C. bonplandi* by Verrill in the Bull. Mus. Comp. Zoölogy. VIII, Mar. 1881; Stoloteuthis (cf. antèa); Inioteuthis n. g. with *I. japonica* and *I. Morsei* V. spp. n. from Yedo Bay, Japan, collected by Professor Morse. Then follows a conspectus of the families, genera and species of Cephalopods included in this paper, specimens of all of which, except *Taonius pavo*, have been examined by the author. The plates reflect much credit on the artist, Mr. Emerton, those which are lithographed coming out with particular beauty.

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[1] Separate copies of this article in advance of the Report were received from the printer at the Smithsonian Inst. April 10, 1882.

"Some notes on American land shells" (I–II, pp. 8 and 13, Journ. Cincinnati Soc. Nat. History, IV, Oct. and Dec., 1881). In these papers Professor A. G. Wetherby discusses the habitat, location, synonyms, etc., of a large number of species of pulmonates. *Ariolimax* var. *hecoxi* is proposed for a form from California which appears to differ from *A. columbianus.* When fully extended, living specimens reach nine inches in length. An albino variety of *Helix fidelis* is noted from Washington Territory. In the second part the molluscan fauna of Roan mountain, North Carolina, is considered, and *Helicodiscus fimbriatus* n. s. is described (p. 9, separate copies). *Patula sampsoni* is proposed as a name for a form closely allied to *P. dorfeuilliana* Lea from Eureka Springs, Ark. The paper closes with an appeal to and some instructions for collectors.

In the *American Journal of Science* (Volume XXII, pp. 411–14, Nov., 1881), Professor Verrill briefly reviews recent papers relating to the East American invertebrate fauna.

Professor Angelo Heilprin (Proc. Acad. Nat. Sci., Phil., Dec., 1881, pp. 423–28) publishes "Remarks on the molluscan genera Hippagus, Verticordia and Pecchiolia," in which he calls attention to and details the confusion existing in regard to these genera, without, however, finally resolving the difficulties. He is disposed to retain Hippagus as distinct from Crenella (to which it has very generally been referred), on the ground that the shell (of Lea's types of Hippagus) is thicker and the umbones more prominently developed and spirally twisted than in Crenella, while on the possibly eroded hinge line he observes no crenulations. In general, however, these would hardly be taken to be "sufficient differences to warrant a generic separation."

Bland, in the Annals. N. Y. Acad. Sci. (II., pp. 115–16), describes (with a figure) a somewhat remarkable new species of Triodopsis (*T. levettei* Bld.) from the vicinity of Santa Fé, New Mexico. In the same publication (pp. 127–28 with cut) he has an article entitled "Notes on *Macroceramus kieneri* Pfr., and *M. pontificus* Gld.," in which he figures the former (from types) and comes to the conclusion that the two are distinct, and that *M. kieneri* Pfr., is not a member of the fauna of the United States.

Geo. W. Harper describes and figures (Cin. Journ. Nat. Hist., IV., part 3, p. 258, Oct., '81) *Patuli bryanti* n. s., from North Carolina, which bears a relation to *P. perspectiva* such as *Helix cumberlandiana* does to *H. alternata.* He also figures, with notes upon the species, *Hyalina significans* Bland.

Rafael Arango describes (Proc. Acad. Nat. Sci., Philadelphia, 1881, pp. 15–16) *Choanopoma acervatum*, *Cylindrella paradoxa*, *C. incerta*, these three illustrated by good cuts, and *Ctenopoma nodiferum*, all new species, together with *Ctenopoma wrightianum* Gundlach, n. sp. These new pulmonates are from Cuba.

Economic Shell-fisheries and Miscellaneous Notes.—The daily press in this, as in almost every field, gathers good wheat as well as chaff, and, occasionally, articles which would do no discredit to permanent scientific literature. Such of the latter as have fallen under the writer's notice are here mentioned as well as more pretentious documents and reports, as in previous years.

"The Oyster Industry," by Ernest Ingersoll (Tenth Census, Section X, Fishery Industries, Monograph B., Dept. Interior, 4to, p. 252, pl. XXX-XLII, Washington, 1881). This forms one of the special monographs on the history and present condition of the fishery industries, by G. Brown Goode, Assistant Director U. S. Nat. Mus., and a staff of associates. It contains descriptive and statistical reports on the oyster industry from Maine to Texas and California; an account of the natural history of the oyster, a glossary of terms and statistical tables. Six of the plates illustrate the development of the oyster from observations by Professor W. K. Brooks (elsewhere noticed) and the remainder tools, barges, etc., pertaining to the business. The vast accumulation of facts brought together is an evidence of great industry, and can be properly estimated only by a specialist familiar with this field. Doubtless, there is some inequality in the character of the information, such as would inevitably result from the sources from which it is derived. Its value will be chiefly realized in the future. For the present, the only criticism which occurs to us, is, that we miss in addition to the accumulated facts, a brief digest from which their bearings might be rapidly gathered. It is probable, however, that this is easier to point out than to remedy.

Report of the Commissioners of Shell-fisheries of Connecticut (Hartford, 1881, 8vo, pp. 35–132), presented to the legislature, January session, 1882. This first report of the Shell-fish Commissioners is included in the same covers, with the sixteenth report of the Fish Commissioners of the State, which occupies the preceding thirty-four pages of the volume. The Shell-fish Commission was established by an act of the legislature approved April 14th, 1881, entitled "An act establishing a State Commission for the designation of oyster grounds," which board is given by Section 1, exclusive jurisdiction over the offshore grounds, north of the New York State line, in Long Island sound, suitable for or occupied by oyster beds. They are empowered to survey and map all the grounds above mentioned, to ascertain the ownership of any that may be claimed by right of occupancy and the area of the natural beds, to report a plan for an equitable taxation of the property in said fisheries, and an annual report of the state of their condition. They are also empowered in the name of the State to grant by written instruments perpetual franchises in such unclaimed grounds, as are not and have not for ten years been natural clam or oyster beds, to citizens of the State applying for them, paying expenses of survey and one dollar per acre for the same for the purpose of planting or cultivating shell-fish thereon. The deeds are to be registered, maps of special sections made, boundary buoys or stakes set, and provision is made for a legal settlement of disputes.

During the seven months, ending with Nov. 30th, 1881, about $8400.00 had been paid into the State treasury from receipts, while $4000.00 had been drawn for expenses incurred.

The report contains, first, an account of lands registered as private property; second, a brief statement of the character of the business of oyster cultivation as practiced in Connecticut; third, the report of J. P. Bogart, Esq., engineer of the board, in relation to surveys made, accompanied by a map of the triangulation executed, and a general map of the State oyster grounds; and lastly, an appendix containing the forms of deeds used, and a compend of the laws of Connecticut relating to shell-fish and fisheries. It is creditable to the State of Connecticut that the importance of the subject has received legal recognition, and to the commissioners, Messrs. R. G. Pike, W. M. Hudson, and Geo. N. Woodruff, that so much has been accomplished with so little expense. This has doubtless been largely due to the intelligence and efficiency of the engineer of the board as well as to the exertions of the members of the commission themselves. Should Maryland and Virginia take similar action in the waters of the Chesapeake, and execute the laws already on the statute book, the inevitable depopulation of the oyster grounds now rapidly approaching, and which will deprive over forty thousand people of their means of livelihood, might be long postponed if not entirely prevented. The crass ignorance of those most interested, however, and its effect on State politics, are such that little in the way of rational legislation is to be hoped for, until after the business in the Chesapeake has practically destroyed itself.

General information about the oyster and clam trade can be found in the weekly issues of Hopson's *Sea World*, etc., for the year 1881.

An important article on "Chesapeake oysters" and the oyster trade of that region generally, can be found in the *New York Herald* for Oct. 11th, 1881, and another on "Oysters in season," in the issue of Aug. 26th, 1881. The business began in Baltimore in 1834, but was of little consequence until 1836, when a packing-house, dealing at first chiefly in raw oysters was established by C. S. Maltby. On both shores of the Chesapeake collectively, there is capital to the amount of more than seven and a half millions of dollars invested—over seventeen million bushels of oysters were handled—over forty thousand people and nearly ten thousand vessels and boats were employed in the business, while the wages earned are about seven millions of dollars. This article is largely indebted to the Census Report on the oyster industry for its facts, but presents them in a compact and handy shape.

The consumption of oysters in New York, as appears from the second article referred to, between September 1st and January 1st, is about fifty thousand baskets *a day* (*sic*), containing about two hundred oysters each. From January to May the consumption is about twenty-five per cent. less. This appears to be at the rate of ten millions oysters a day, or eight oysters *per capita* for the entire population of the city, an estimate which seems grossly excessive on the face of it, unless it be understood that the New York dealers sell oysters to private parties or small dealers in the surrounding country, which are included in the above figures, as well as the actual local consumption.

A large natural bed of oysters, covering over one hundred acres was discovered in Smithtown bay, on the north shore of Long Island, N. Y., in September, 1881. It is in deep water and very rough bottom. The discovery created an immense excitement among the fishermen, who flocked from every quarter to avail themselves of the unclaimed treasures.

Lippincott's Magazine (May, 1881, pp. 479–492) has a well-illustrated article on oysters and oyster culture, here and abroad, under the title of " Oyster culture," by W. F. G. Shanks.

" Deterioration of American Oyster beds " is the subject of two articles, by Lieut. Francis Winslow, U. S. N., in the *Popular Science Monthly* (Vol. xx, No. 1, pp. 29–42, Nov., 1881; No. 2. pp. 145–155, Dec., 1881), in which the danger to the Chesapeake beds, now imminent, is pointed out, and remedies are discussed and illustrated by instances of experience of European communities. So long as the community most directly interested remains, from ignorance, obstinately incredulous and unwilling to take any precautions whatever, or even enforce the existing laws, nothing can be done, and it is probable they will awake to the danger only when it is too late.

The Sea World, Fishing Gazette and Packer's Journal, a quarto weekly periodical, devoted in large part to the annals and interests of the edible shell-fish trade, has completed its third volume. It is published by W. B. Hopson at New Haven, Conn., and apparently printed and issued in New York. Those interested in the economical shell-fish will find it worth while to refer to its files. In the number for Dec. 7th, 1881, an interesting account is given of oyster culture, near Groton, Conn., in the Poquonock river. White birch bushes, of proper size, are cut and stuck into the river bottom (soft mud) where there is about twelve feet of water at low tide. The spat adheres to the bushes and grows finely, twenty-five bushels of oysters (seven bushels marketable and the remainder " seed " oysters) having been taken from one bush which was four inches through the butt and had been set eighteen months. The average yield, however, is about five bushels to the bush. As the bottom is muddy, the spat which is caught by the bushes would otherwise be a complete loss. The oysters are said to be of fine flavor and rather peculiar shape. About fifty acres are devoted to this business. Although the bushes are always under water, a strong opposition to this mode of planting has been developed in the neighborhood which threatens to terminate the trade. The ostensible ground is, that it is liable to produce disease in the vicinity, which would seem to be an unwarranted assumption, and the editor ascribes the attack on the planters to "the determined opposition to oyster culture which has always been noticeable in that section of Connecticut." Why any one should oppose the cultivation of oysters does not seem clear.

In New Haven, Conn., in the autumn of 1881, was reported a singular scarcity of oyster shells for use in planting new beds for the " spat " to settle upon. The value of a bushel of the shells had risen to five and even seven cents a bushel. Formerly surplus oyster shells were used in making roads about New Haven and the smoothness, hardness and freedom from dust of the " shell roads " was so well known as to become proverbial. But the scarcity of the shells, unless it proves to be merely temporary, will soon make the " shell road " a thing of the past.

The franchise for fish and oysters in the Gulf of California is held by Don Guillermo Andrade by a concession from the Mexican authorities. A party has recently gone to investigate the islands covered by his concession, with a view of establishing packing establishments, for putting up turtle flesh and oysters in cans for export.

The "Market Review for 1881" (San Francisco, Cal.), states that the quantity of abalones (Haliotis of several species) shipped by sea from California in 1880, was 6372 sacks, valued at $46,179.00; and in 1881, 4522 sacks, valued at $18,529.00. This is exclusive of the quantity shipped by rail which is probably much greater. Owing to the demand for iridescent buttons now in fashion, the manufacture of these shells is very large. In this country the work is largely done in Philadelphia and New York. A considerable quantity of the shells are shipped to France; of the more solid and perfect shells, solid buttons are made, the refuse is ground up and mixed with cement which is molded into buttons, which display in their substance myriads of brilliant particles. The compound may be more conveniently and artistically treated than the solid shell itself, as well as at less cost.

An account of "Pearl diving (for *Margaritiphora californica* Cpr.) in the Gulf of California" taken from the "Youth's Companion" appears in the San Francisco *Bulletin* for Nov. 9th, 1881. Two or three tons of fresh shells were obtained per day when weather permitted. They were allowed to die before being searched for pearls. The locality was called Bonita bay, being about fifty miles north of Loreto. The water was forty feet deep and only about one shell in one thousand contained a valuable pearl. Sharks and squids rendered diving (in a suit of rubber armor) exciting, if not dangerous.

Eleven thousand bushels of clams (*Venus mercenaria* L.) were sent to market by the fishermen of East Hampton, Long Island, N. Y., in 1881.

In the Bulletin of the United States Fish Commission (I. p. 21, Apr. 13th, 1881) Mr. John A. Ryder prints an extract from a letter to Mr. Tryon, by Henry Hemphill, calling attention to the valuable qualities of *Glycimeris generosa* Gould, as a food mollusk. It is found at Olympia, Washington Territory, and is said to resemble "scrambled eggs" in taste. They are called "Geoducks" by the urchins of Olympia, and "Kwenuks" by the Indians. The Fish Commission is investigating the question of transplanting these valuable mollusks to the east coast of the United States. In the same publication (pp. 200–201) with the title of "On the habits and distribution of the Geoduck," etc., is printed a letter from Hemphill on the same subject, in which he mentions that a large specimen will afford a pound of delicious flesh for food. They burrow very deeply into the sand, however, and do not come much above extreme low tide limits, so that it is not easy or convenient to get at them except at low spring tides. On the other hand, they are said to be finer eating than any other mollusk, not excepting the oyster.

At a recent meeting of the Harbor Commissioners in San

Francisco, the Chief Engineer reported that the San Rafael ferry-slip, now six and one-half years old, was practically ruined by the teredo and would have to be replaced. Nearly all the submerged wood-work was actually destroyed.—*San Francisco Bulletin.*

W. N. Horton, of Olympia, W. T., has invented a plan for circumventing the teredo. He is also the inventor of a process for boring logs for water pipes and pumps. His machinery cuts out a cylinder two inches thick, from between the core and the outside of a log and of any desired caliber. By retaining the core and filling the cylindrical excavation around it with a special cement, it is thought that the ravages of the teredo would be confined to the outer part of a pile, so treated, and the core which is expected to sustain the needed weight would be protected by the cement, which in its turn would be preserved from friction by the outer coating of wood and bark.

In the *Sea World* elsewhere alluded to (Dec. 7th, 1881), a resumé of facts relating to the giant cuttlefishes, is given, under the title of "The Devil Fish of the Atlantic."

In the *Weekly Bulletin*, San .Francisco, Aug. 24, 1881, in an article on "San Francisco Fishermen," it is stated, that the Octopus (*O. punctatus* Gabb) is largely used for food by the Italian fishermen of that port, being made into a kind of chowder with vegetables and a sauce of olive oil and lemon juice, after the intestines have been removed, and is considered as especially appropriate food for fast-days. They are also dried for export by the Chinese.

In the Gulf of California the ten-armed cuttles sometimes attack the divers for pearl oysters. One killed, while attacking a diver, had arms twelve feet long, and a body larger than a beef barrel (*Ib.*, Nov. 9th, 1881.)

The *New York Herald*, of Nov. 25th, 1881, gives three columns to an account, by Mr. Morris, of the capture of an immense squid (*Architeuthis harveyi* V.) at Portugal cove, Newfoundland, on the 10th of November, and a resumé of facts relating to these animals. The specimen in question was brought to New York. *Harper's Weekly* for Dec. 10th, '81, has an illustrated article on the same subject apparently by the same author.

A fictitious account of an imaginary capture of a giant squid ("Architeuthis") appears in *Lippincott's Magazine*, Aug., 1881, p. 124, from the pen of Mr. C. F. Holder.

"Mortality among Architeuthidæ." Professor Verrill (*Am. Journ. Sci.*, XXI, p. 251, Mar., 1881) notes a strange mortality of giant squids ("Architeuthis"), which, according to Capt. J. W. Collins, occurred in Oct., 1875. Twenty or thirty specimens were found floating on the water and secured for bait by the fishing fleet. They were mostly somewhat mutilated when found.

A novel mission in England sends beautiful sea-shells, which are generally collected by children, to little sick people in homes or hospitals. Since May, 1879, it has distributed a quarter of a million of shells from the West Indies, South Africa and Spain, as well as from the English coast.—*Foote's Leisure Hour.*

A specimen of *Tridacna gigas* Lam., weighing 528 pounds, was obtained by Professor Ward, of Rochester, New York, at Singapore. It was thirty-six inches long and twenty-seven broad, and was presented to the California State Mining Bureau, by Mr. J. Z. Davis.—*S. F. Bulletin*, Mar. 2d.

Erratum.—By an inexplicable and unfortunate "lapsus" in this record for 1880 (p. 716), the name of W. H. Ballou was substituted for that of Rev. W. M. Beauchamp, who should have been credited with the authorship of the note on the distribution of *Bythinia tentaculata* in the United States (cf. AM. NAT., July, 1880, p. 523, and Mar., 1882, pp. 244–5).

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THE ORGANIC COMPOUNDS IN THEIR RELATIONS TO LIFE.[1]

BY LESTER F. WARD.

IN a paper on the "Formation of the Chemical Elements,"[2] read March 29, 1879, before the Philosophical Society of Washington, I proposed the following *cosmical definitions* of the three principal known forms of matter:

"*1. Chemical Elements.*—Substances whose molecules are composed either of those of other chemical elements of less atomic weight, or of such as are too low to be capable of molar aggregation, and therefore imperceptible to sense: formed during the progress of development of star-systems at temperatures higher

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[1] Read before the Philosophical Society of Washington, January 28, 1882; also read before the Biological Section of the American Association for the Advancement of Science at Montreal, August 29, 1882.

[2] "Evolution of the Chemical Elements," in the *Popular Science Monthly*, Vol. XVIII (February, 1881), pp. 526–539.